Spot Safety Project Evaluation

Project Log # 200712102

Spot Safety Project # 03-01-216

Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of US 17 (Ocean Hwy) and
SR 1168 (Country Club Rd) / SR 1300 (Calabash Rd)
Brunswick County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ _____
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 03-01-216 – The Intersection of US 17 (Ocean Hwy) and SR 1168 (Country Club Rd) / SR 1300 (Calabash Rd) in Brunswick County, just north of the South Carolina border.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a multi-phase, actuated traffic signal. Throughout the study period, US 17 has been a four lane divided facility with auxiliary left and right turn lanes on both approaches to the subject intersection with a speed limit of 55 mph. SR 1168 / 1300 were both two-lane facilities at the subject intersection with channelization islands and speed limits of 35 mph and 55 mph, respectively. The subject location is a crossroads type, which was controlled by a stop signs on SR 1168 / 1300 in the before period.

The original statement of problem was the large number of angle type crashes from motorists attempting to cross US 17 from either side street. The intersection met volume warrants 1B and 2.

The initial crash analysis was completed from May 31, 1998 to May 31, 2001 with sixteen (16) reported crashes, fourteen (14) of which were Angle Crashes. The final completion date for the improvement at the subject intersection was on December 18, 2002 with a total cost of $75,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from November 1, 2002 to January 31, 2003. The before period consisted of reported crashes from March 1, 1998 through October 31, 2002 (4 years and 8 months); and the after period consisted of reported crashes from February 1, 2003 through September 30, 2007 (4 years and 8 months). The ending date for this analysis was determined by the date of available data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map, aerial map, and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	30	31	3.33 %
Total Severity Index	15.55	11.44	- 26.43 %
Target Crashes	27	23	- 14.81 %
Target Crash Severity Index	16.61	11.13	- 32.99 %
Volume	15,800	17,700	12.03 %
Injury Crash Summary – Total			
Fatal injury Crashes	0	1	100.00 %
Class A injury Crashes	4	2	- 50.00 %
Class B injury Crashes	11	6	- 45.45 %
Class C Injury Crashes	7	7	0.00 %
Total Injury Crashes	22	16	- 27.27 %

The naive before and after analysis at the treatment location resulted in a 3 percent increase in Total Crashes, a 15 percent decrease in Target Crashes, and a 26 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2005.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 26 percent decrease in Total Severity Index and an 15 percent decrease in Target Crashes. The summary results above demonstrate that both Target Crashes and the severity of crashes appear to have decreased at the treatment location from the before to the after period.

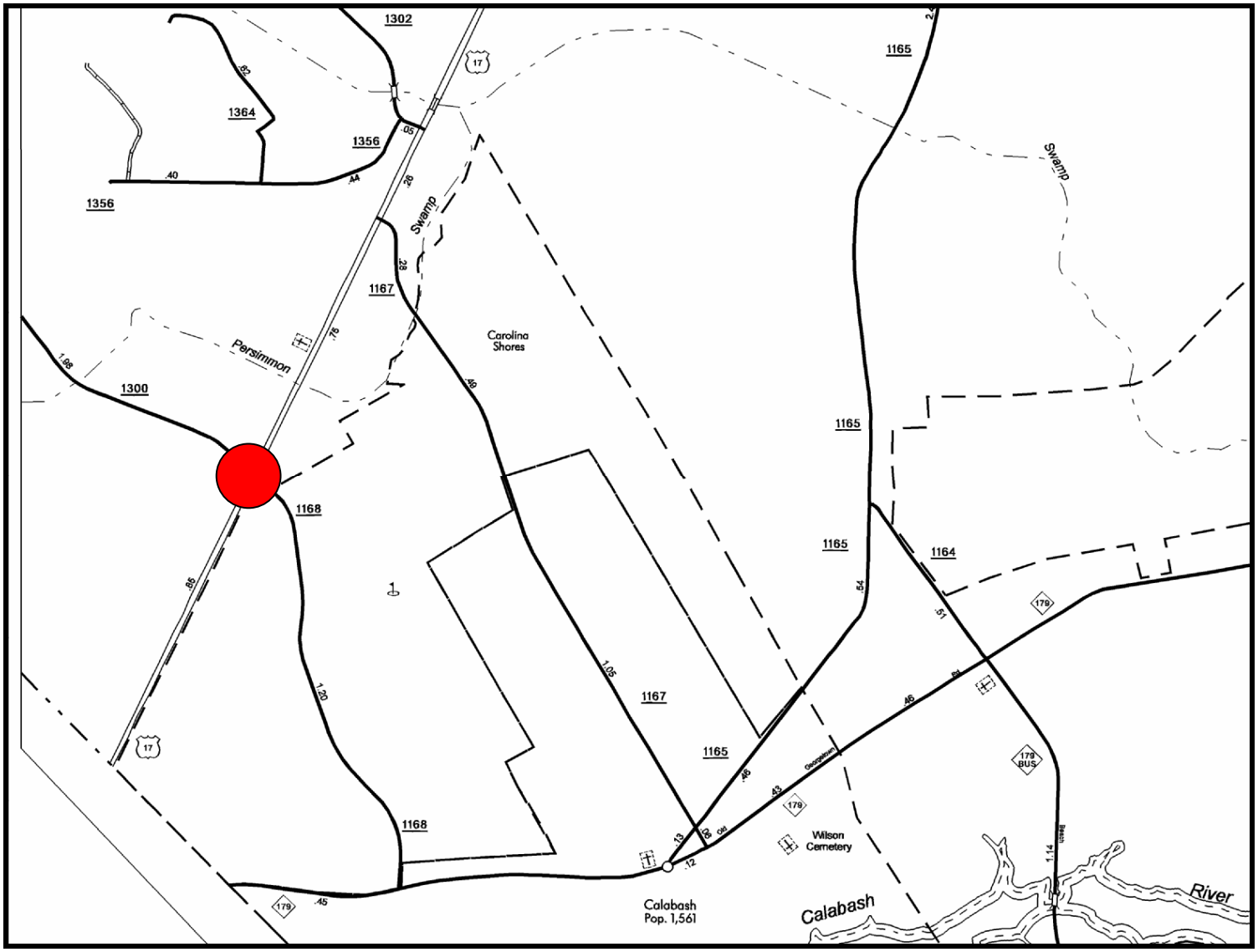
Referencing the *Collision Diagrams*, a large portion of crashes at the intersection in the before period (26 of 30) were the result of a vehicle unsuccessfully crossing US 17 resulting in an angle collision. After the signal installation, this pattern was significantly reduced to just four (4), all of which resulted when a vehicle ran the red light.

However, after the signal installation, a new pattern of left turn – same roadway type collisions developed from the permissive left turn phase on US 17. This resulted in a fatality in February of 2006 and upon review of the fatal investigation, the US 17 left turn phase was changed to protected only for both directions. The last 1.58 years of the after period had protected only left turn phasing on US 17 and it resulted in just one (1) left turn – same roadway collision with the driver running a red light. By converting from protected / permitted to protected phasing in the after period, the left turn – same roadway crash pattern went from 18 (5.8 crashes per year) to 1 (0.6 crashes per year).

The calculated benefit to cost ratio for this project is 8.44 considering total crashes. The benefit to cost ratio considering only target crashes is 16.17. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

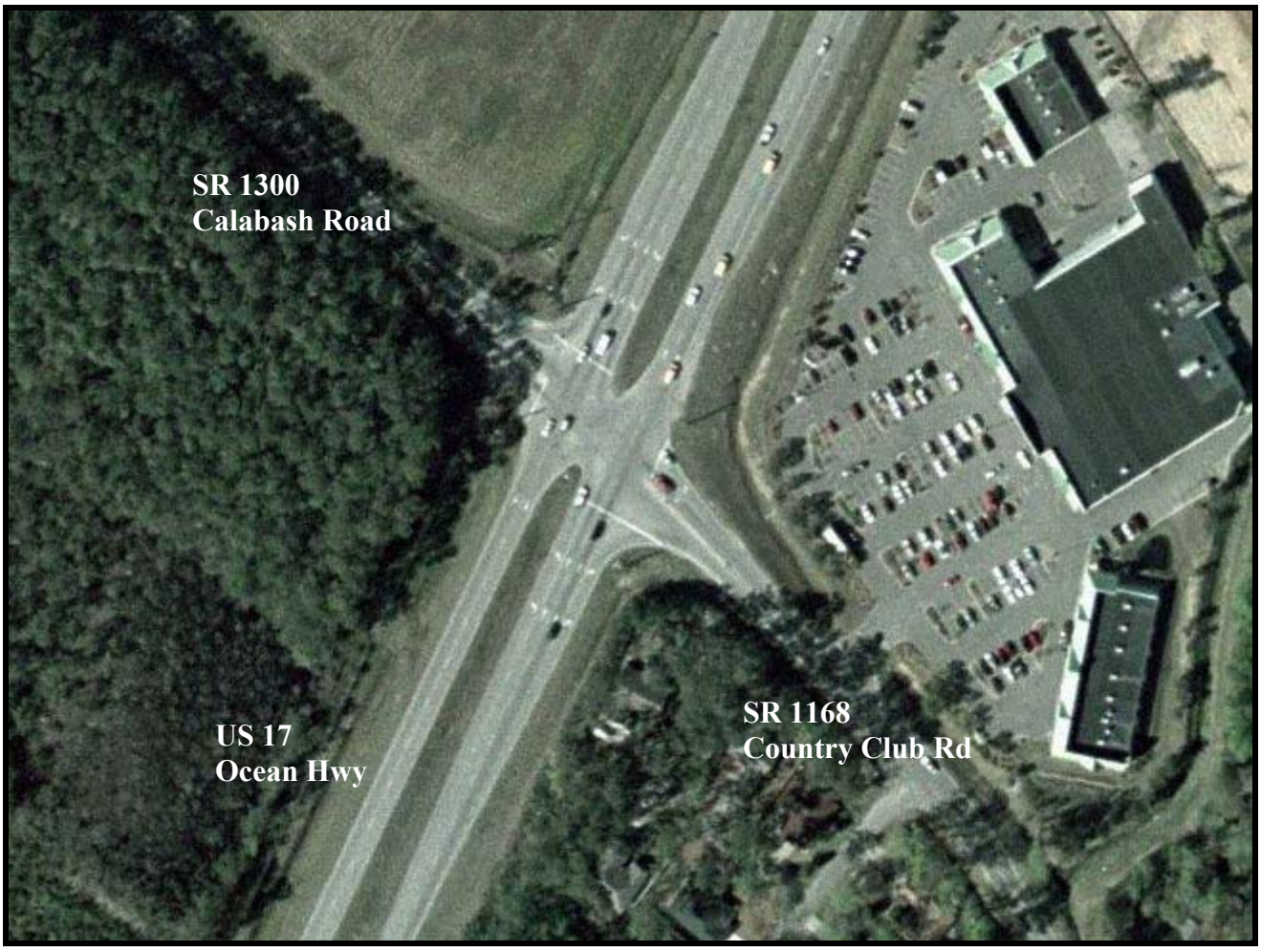
Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Brunswick County, near Town of Calabash / SC Border
Evaluation of Spot Safety Project # 03-01-216



Treatment Location: US 17 (Ocean Hwy) at SR 1168 (Country Club Rd) / SR 1300 (Calabash Rd)

SS# 03-01-216 Aerial Map
Brunswick County, near South Carolina Border



TREATMENT SITE PHOTOS TAKEN 4/9/2008

Traveling East on SR 1300 (Calabash Rd)

Traveling East on SR 1300 (Calabash Rd)

Traveling West on SR 1168 (Country Club Road)

Traveling West on SR 1168 (Country Club Road)

Traveling North on US 17 (Ocean Highway)

Traveling South on US 17 (Ocean Highway)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 17 at SR 1168 / 1300 BY: JBS
COUNTY: Brunswick DATE: 4/21/2008
FILE NO.: SS 03-01-216 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$75,000	10	0.149	$11,177
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$75,000	10	0.149	$11,177

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $14,277
TOTAL COST OF PROJECT= $75,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.67	4	0.86	18	3.85	8	1.71	$504,325
AFTER	4.67	3	0.64	13	2.78	15	3.21	$383,833

Annual Benefits from Crash Cost Savings $120,493

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $106,215

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 8.44

TOTAL COST OF PROJECT - $75,000 COMPREHENSIVE B/C RATIO - 8.44

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 17 at SR 1168 / 1300 BY: JBS
COUNTY: Brunswick DATE: 4/21/2008
FILE NO.: SS 03-01-216 NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$75,000	10	0.149	$11,177
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$75,000	10	0.149	$11,177

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $14,277
TOTAL COST OF PROJECT= $75,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

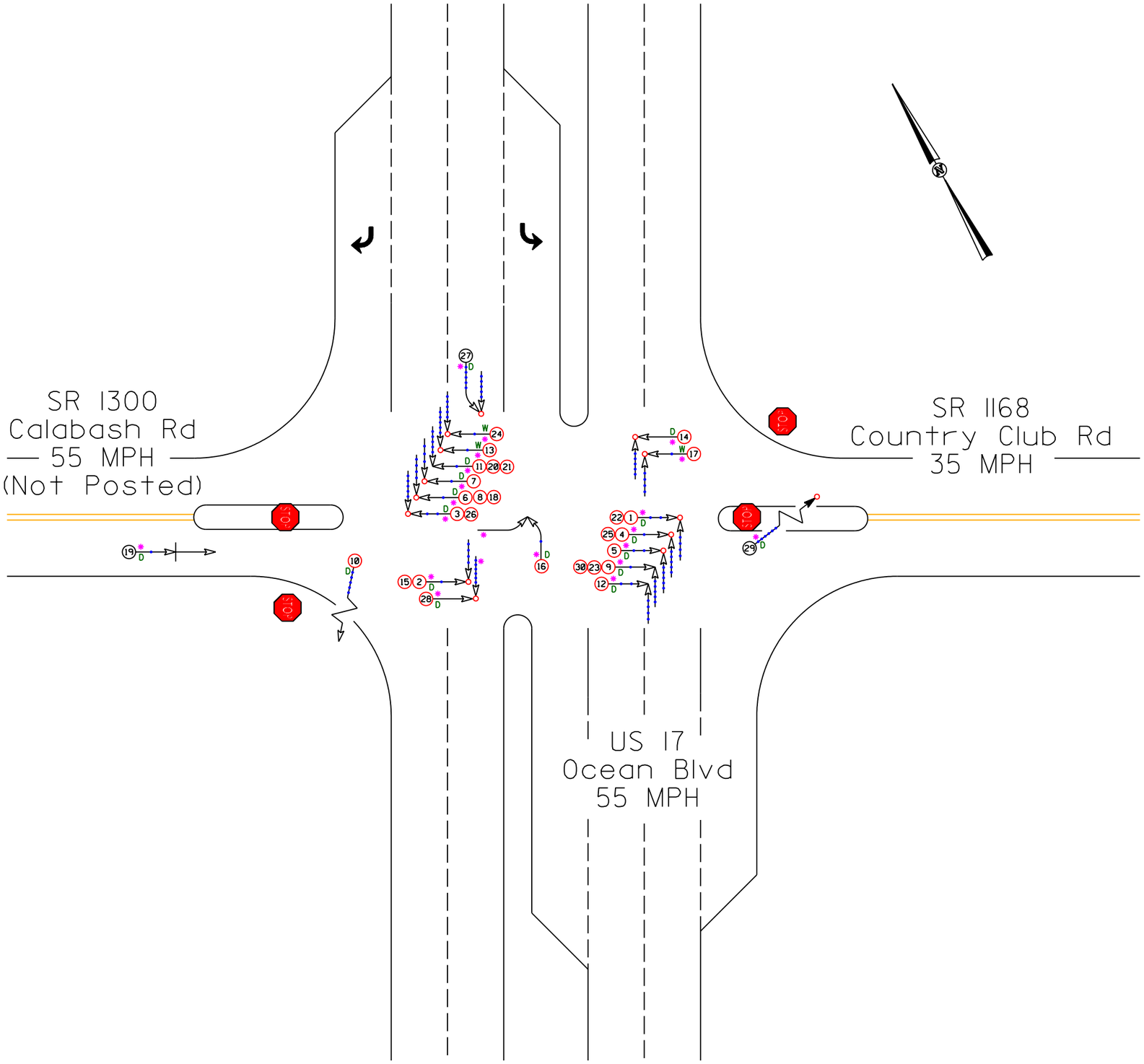
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.67	4	0.86	16	3.43	7	1.50	$495,782
AFTER	4.67	2	0.43	11	2.36	10	2.14	$264,882

Annual Benefits from Crash Cost Savings $230,899

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $216,622

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 16.17

TOTAL COST OF PROJECT - $75,000 COMPREHENSIVE B/C RATIO - 16.17



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

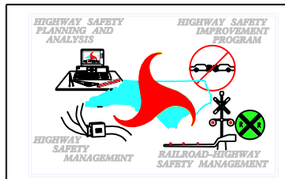
9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

SS# 03-01-216
Brunswick County
City of Calabash
BEFORE Period
3/1/98 - 10/31/02
US-17 at SR 1168/1300

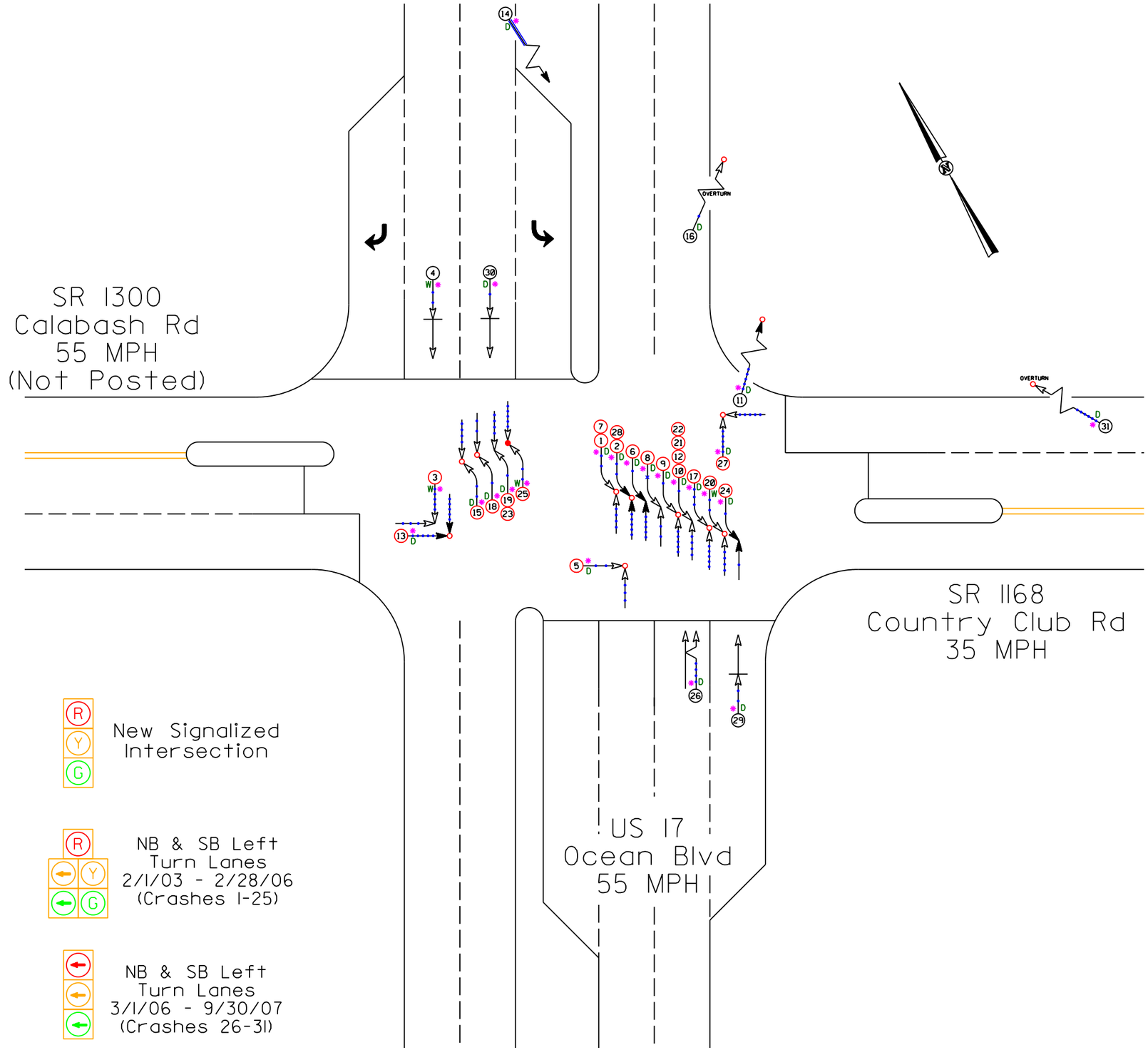
Frontal Impact & Avoidance

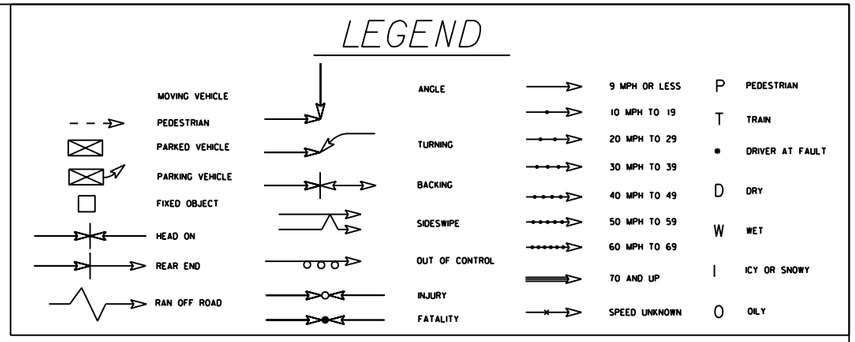
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
DIVISION: 3	AREA:
STUDY PERIOD: 3/1/1998 - 10/31/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 2-25-2008	
LOG NUMBER: SS# 03-01-216	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH





SS# 03-01-216
Brunswick County
City of Calabash
AFTER Period
2/1/03 - 9/30/07
US-17 at SR 1168/1300

New Signalized Intersection

NB & SB Left Turn Lanes
2/1/03 - 2/28/06
(Crashes 1-25)

NB & SB Left Turn Lanes
3/1/06 - 9/30/07
(Crashes 26-31)

Frontal Impact & Avoidance

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 3	AREA:
STUDY PERIOD: 2/1/2003 - 9/30/2007	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 2-26-2008	
LOG NUMBER: SS# 03-01-216	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH